

# Drones new research tool for wildlife, land

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Mark Bauer, with the US Geological Survey sets up an antenna mast so they can use a Honeywell T-Hawk, an unmanned aerial vehicle or drone, at the Las Cienegas National Conservation Area. The USGS and Bureau of Land Management are conducting vegetation surveys of the grasslands in the area to study the impact of the local watershed. They are using the drones as a research tool to get a detailed photographic record of the area. The information will provide information such as surrounding tree species and types of grass. The area at the site they are surveying is around 700 meters in diameter. The rolling grasslands and lush riparian corridors of Las Cienegas, located 45 miles southeast of Tucson, are protected as a National Conservation Area. The photo was taken on Monday, November 17, 2014, outside Tucson, Ariz.

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**LAS CIENEGAS NATIONAL CONSERVATION AREA** — It's black and squat, matches the size of a small trash can, and looks a bit like R2D2 from "Star Wars."

It also may represent the future of how federal agencies research the health of land and wildlife from the air.

On Monday morning, an unmanned drone, with an advanced point-and-shoot camera attached, rose about 200 feet above the grasslands here, about 40 miles southeast of Tucson. Its purpose was to help researchers understand how efforts to restore some of these same grasslands are working.

For about 30 minutes, the gasoline-powered drone, giving off a low-pitched, whine befitting its name, flew back and forth over a patch of grasslands along and near Gardner Canyon, about five miles east of the main ranch house at the historic Empire Ranch. The canyon, a tributary to Cienega Creek, is a valued riparian area lined with cottonwood and ash trees that were showing fall's yellow colors.

The morning flight was the first of five flights conducted Monday at Las Cienegas, a federal grasslands conservation area and cattle ranch owned and managed by the Bureau of Land Management. It will be followed today and Wednesday by more drone flights over 20 wetland areas along the main Cienega Creek, considered one of Southern Arizona's best remaining free-flowing streams.

A joint effort of the U.S. Geological Survey, the BLM and the nonprofit Nature Conservancy, the drone-based research is seen by many in these agencies as a path toward better research at less cost. It's BLM's third use of drones in Arizona, and USGS' first use of drones in Arizona and 19th use of them for research across the country, mostly in the West.

Later this week, the agencies will take their drone — a model named T-Hawk, designed and built by Honeywell Inc. in Albuquerque — to the Silver Creek area east of Douglas for more research.

The drone's camera shot roughly 8,000 images Monday. The research is focusing on several key issues at this site.

There, the Nature Conservancy, working with a group of youths, has already placed several truckloads of rocks on the ground near Gardner Canyon to slow the flow of floodwater and reduce soil erosion in the area.

Standing on an overlook near where the drone was flying, conservancy ecologist **Gita Bodner** pointed to Gardner Canyon about a quarter-mile away, and noted that much of the ground bordering it was bare before the youths unloaded the rocks there last summer.

It had been barren in some spots for well over a century, due to historic downcutting of the streambed and other forces caused in part by massive overgrazing and other human impacts that left the soils vulnerable to wind erosion, she said.

Now, however, grasses have already grown up near the rocks, and the soil has been stabilized, she said. This is already visible in spots near the creek.

Researchers hope the drone photos will document these changes. Later, it's hoped that the photos taken now will provide a baseline to gauge the effectiveness of future restoration done in that area.

"We're trying to use this in place of humans, which would be more intrusive on the land, so we're not out tromping all over the area," observed **Laura Norman**, a USGS research physical scientist from Flagstaff who is in charge of the drone-based monitoring project. "We can also collect much more data this way."



At the ground command center, John Vogel, middle, and Mark Bauer, with the U.S. Geological Survey, plan the next flight. The drones are being used as a research tool to get a detailed photographic record of the Las Cienegas area.

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The cost of drone research is also as little as one-fourth the tab for traditional research by helicopter or light aircraft, added **John Vogel**, a USGS geographer working at the Las Cienegas project site. Taking photos using a helicopter can cost \$6,000 for four hours, he said.

“How valuable is this? It’s incredibly valuable,” said Vogel. “People couldn’t do this. It would take too much time. If you use aerial photos or satellite imagery, you can’t get to the species level of the grass and trees on the ground.

“With the drones, you can identify the tree and grass species and you can identify the vegetation health, and monitor the vegetation and stream channel changes and the wildlife.”

“It’s a niche that isn’t filled right now,” said Vogel. He compared drone aircraft to “a flying chainsaw engine without the chain.”

The limits of this technology include that it takes a long time to get the small craft in the air, he said. It took nearly an hour or more Monday after research crews arrived at the Las Cienegas site before the first flight began.

Also, the drones are very noisy and their engine vibrations can cause problems getting crisp images from the air, Vogel said. These drones use gasoline — not batteries — and take time to refuel, although they’re more efficient than those that use batteries, causing tradeoffs between the two uses, he said.

Still, the agencies are happy to have cleared bureaucratic hurdles to their use with the Federal Aviation Administration.

The FAA has put a hold on the commercial use of drones until it develops regulations governing their use. Those regulations are supposed to come out in January, and the delays have frustrated drone advocates who see this technology as a gateway to a huge expansion of jobs and a big boost for the economy.

For a time, the FAA also required federal agencies to get a permit for every research project using drones.

But since 2013, agencies such as BLM and USGS have had a specific memorandum of agreement with FAA allowing them to conduct drone-based research as long as they notify the aviation administration of plans for a specific project 48 hours in advance. In addition, they're not supposed to fly more than 400 feet above ground, or closer than 5 miles from an airport.

In the future, expanded use of these crafts will create jobs, in manufacturing the aircraft, creating software to program them and employing people to run them, Vogel said.

"It's going to be a whole new industry in place of what's in place now," he predicted.

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